U.S. Department of Energy

Office of Science

Office of Nuclear Physics

Exploring Nuclear Matter - Quarks to Stars

NUCLEAR PHYSICS AND RELATED COMPUTATIONAL SCIENCE R&D FOR ADVANCED FUEL CYCLES WORKSHOP

Sponsored by the Offices of
Nuclear Physics and Advanced Scientific Computing Research

Goals of the Workshop

Office of Nuclear Physics Perspective

Dennis Kovar

Associate Director of the Office of Science
for Nuclear Physics

August 10, 2006

U.S. Department of Energy

Office of Science

Welcome

Office of Nuclear Physics

Exploring Nuclear Matter - Quarks to Stars

- **What does the Nuclear Physics program do?**
- **How does the program accomplish its mission?**
- **Advanced Fuel Cycles and Nuclear Physics.**
- **Goals of this workshop**
- **Deliverable and the future.**

Nuclear Physics Program Mission

The Nuclear Physics program fosters fundamental research to:

- Provide new insights and advance our knowledge on the nature of matter and energy.
- Develop the scientific knowledge, technologies and trained workforce that are needed to underpin the DOE's missions for nuclear-related national security, energy and environmental quality.
- Provide world-class, peer-reviewed research results.
- Operate user accelerator facilities in the scientific disciplines encompassed by the the Nuclear Physics mission areas.

Nuclear Physics Program Activities

The Nuclear Physics program:

- Consists of four subprograms--Medium Energy, Heavy Ion, Low Energy and Theory, including Nuclear Data.
- Supports university and laboratory R&D in these subprograms, including support of graduate students and postdoctoral associates.
- Operates fours national accelerator facilities--CEBAF, RHIC, ATLAS, HRIBF; the 88-Inch Cyclotron; and university accelerators at TAMU, TUNL and Yale.
- Fabricates sophisticated detectors, instrumentation and experimental equipment.
- Nurtures core competencies such as superconducting radiofrequency technology.

U.S. Department of Energy

Office of Science

Advanced Energy Initiative

Office of Nuclear Physics

Exploring Nuclear Matter - Quarks to Stars

" A secure energy future for America must include more nuclear power."

President Bush addressing the National Small Business Conference April 28, 2005

"So tonight I announce the Advanced Energy Initiative -- a 22 percent increase in clean-energy research at the Department of Energy to push for breakthroughs in two vital areas. To change how we power our homes and offices, we will invest more in zero-emission coal-fired plants; revolutionary solar and wind technologies; and clean, safe nuclear energy."

President Bush in his State of the Union Address
January 31, 2006

Advanced Fuel Cycles and Nuclear Physics

The President's Budget for Nuclear Physics for FY 2007 states in part:

"Funding is provided within the Low Energy subprogram to support research efforts that are also relevant to the design of next generation nuclear reactors. This research can help to provide the nuclear data and knowledge required for advanced nuclear fuel cycles. Additional funding is provided for this effort in the Theory subprogram for Nuclear Data activities. This effort is carried out in collaboration with the ASCR program and other DOE programs…."

A total of $2.43 million is requested in FY 2007 for the Nuclear Physics program for this research and development.

This joint workshop conducted with ASCR is to identify the leading scientific issues for nuclear cross sections, nuclear data and related computations.

Workshop Goals

Goals of Workshop:

–Determine what nuclear physics R&D is needed for the AFC.

What are the specific needs of the AFC for nuclear physics R&D?

–Determine whether and how “needs” can be met by existing programs.

Does NP have the needed tools?

Is the existing nuclear data program database adequate for AFC needs?

–Determine what facilities are appropriate for the R&D program.

Are additional investments in existing NP facilities needed?

–Identify NP related computing resources required for modeling and simulation.

What computational effort should be undertaken to provide theoretical and calculational support for the measurements?

The Deliverable

Deliverable:

Written report to the NP and the ASCR that provides:

- Specific recommendations for nuclear physics research needed for AFC
- Assessments of appropriate facilities and capabilities for the needed work

Deliverable Date: Mid September 2006

Follow on:

The output of the Workshop will be used by NP to help identify appropriate areas for funding following an anticipated fall 2006 solicitation.

In Summary…

What can Nuclear Physics Provide?

Fundamental Nuclear Physics Research Community and Facilities

- **Facilities**
  - Neutron cross sections for AFC
    - ORELA (ORNL), LANSCE (LANL)
      - Complementary energy regions
  - Nuclei off stability--properties/decay of nuclei in AFC
    - HRIBF (ORNL), ANL (ANL)
- **Nuclear Theory**
  - Calculation of nuclear properties
- **Nuclear Data**
  - Evaluated nuclear cross sections and properties
- **Computations**
  - Partnering with ASCR provides link with advanced computing technology

- **Nuclear Physics has some tools and researchers that might address important AFC research and development issues.**

Thank You

We believe this workshop is an important step in our efforts to identify areas of fundamental nuclear physics R&D that will support a critical new energy initiative.

We thank the co-chairs, panel members, and workshop participants for your efforts in this task.